NEMS-GIS Regional Demand Forecasts

Presentation at the GIS/Regionalization Workshop

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by

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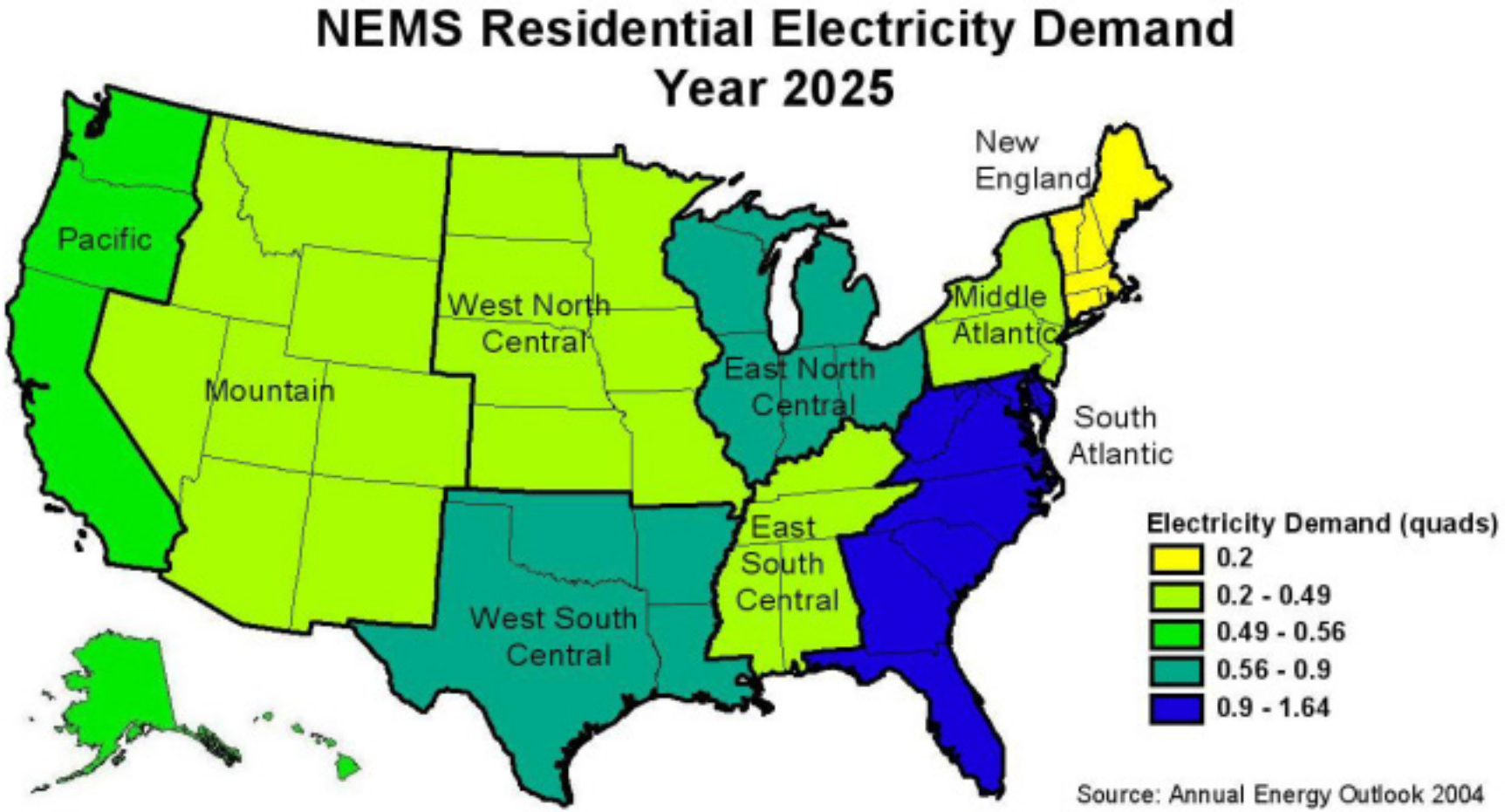
Overview

- NEMS works as an integrated US energy system tool but lacks regional resolution, which is a key factor in analyzing the benefits of distributed energy production methods
- Forecasting tool is needed with national scope but regional scale
- Primary objectives are to disaggregate NEMS national forecasts of energy demand to the county scale, to validate results against measured data, and to present data within a forecasting framework
- Method can be applied to multiple years, sectors and energy sources (electricity, natural gas)
- Current focus is on commercial and residential electricity demand

The Geographic Scale of NEMS- Demand Side



Disaggregated by Population and Climate

NEMS Energy Forecasts (census division, year, sector, fuel)

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Distribute by Population (county, year)

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Distribute by Climate (climate zone, sector)

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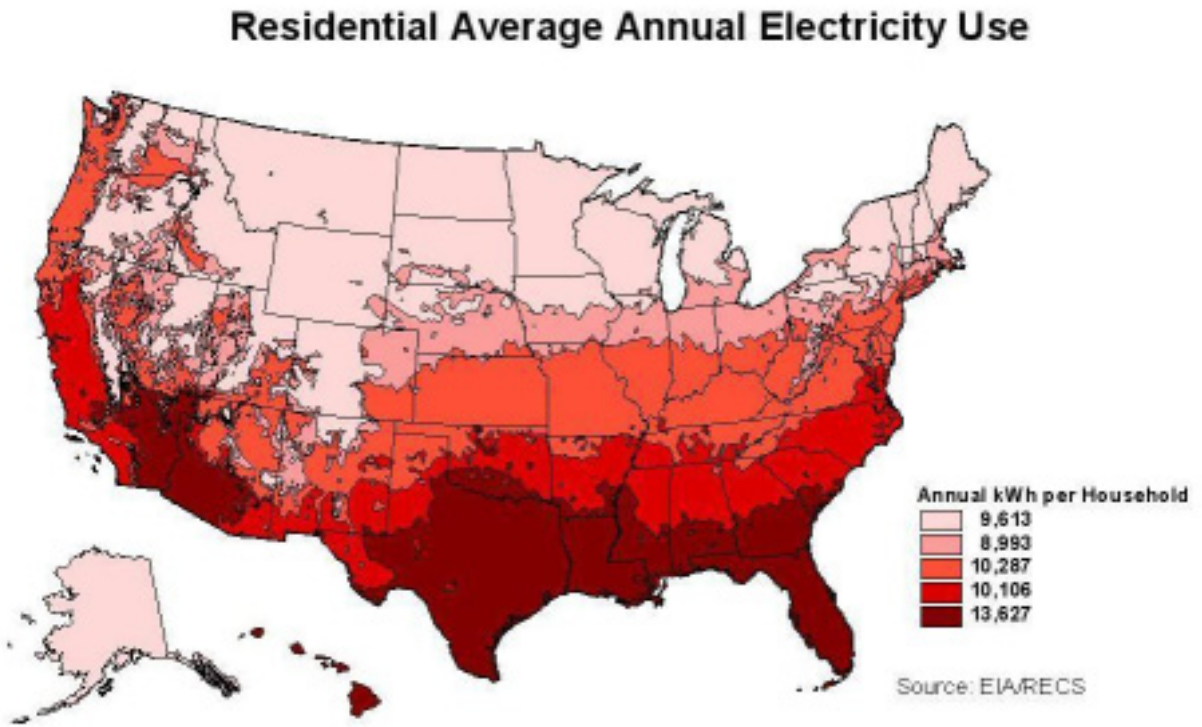
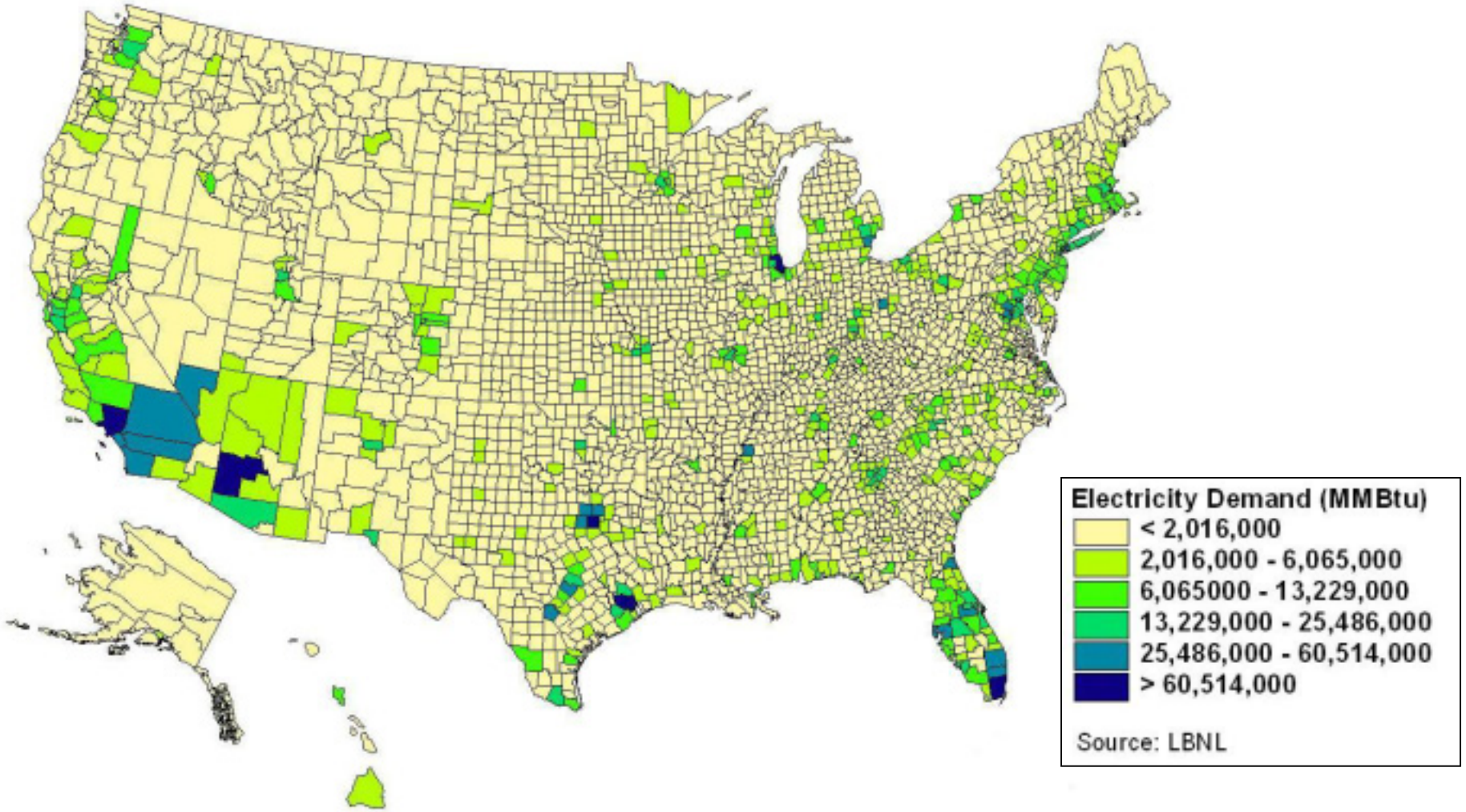
Normalize by NEMS Energy Totals (census division, year, sector, fuel)

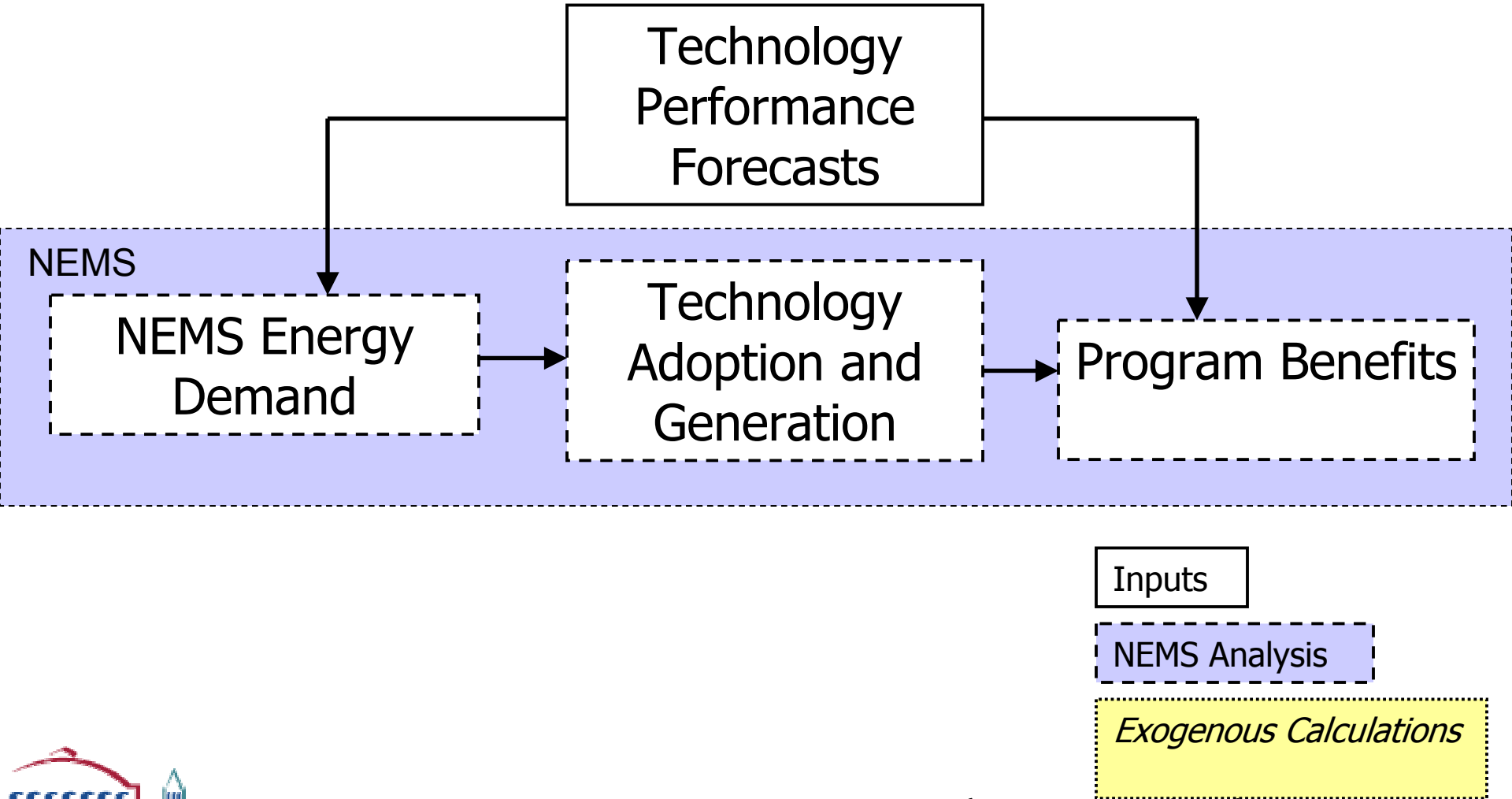
- Population forecasts by county (www.epa.gov/ttn/naaqs/ozone/areas/pop/pop_proj.htm)
- Climatic effects on annual energy intensities (1999 CBECS and 2001 RECS)



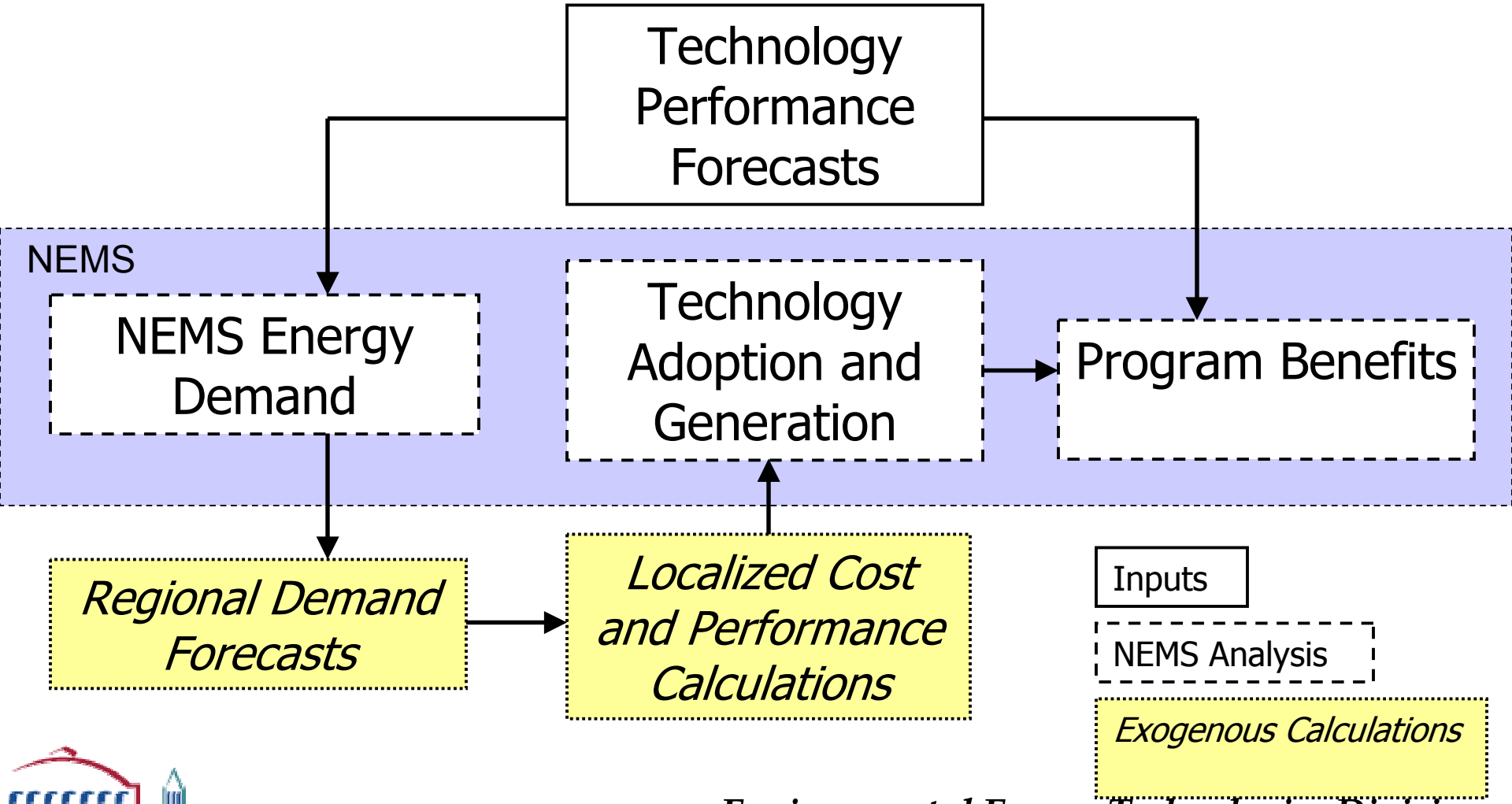
Output- Total Residential Electricity Use in 2025 by County



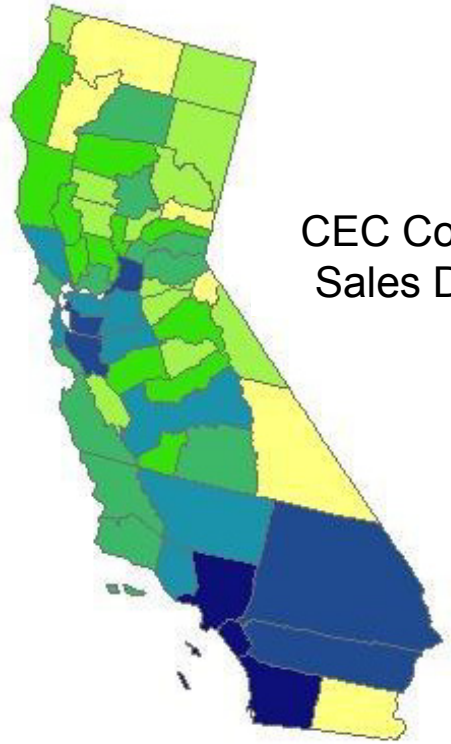
Integration with NEMS: Technology Adoption Example



Integration with NEMS Continued

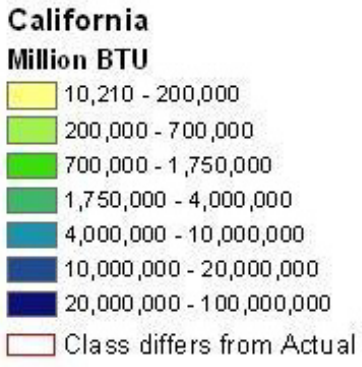


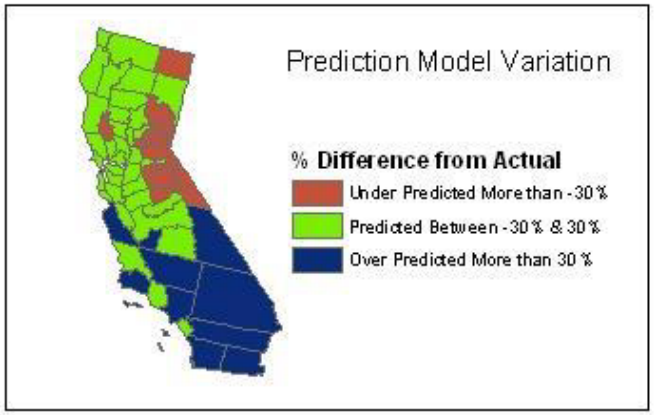
Current Status: Base Year 2000 Validation

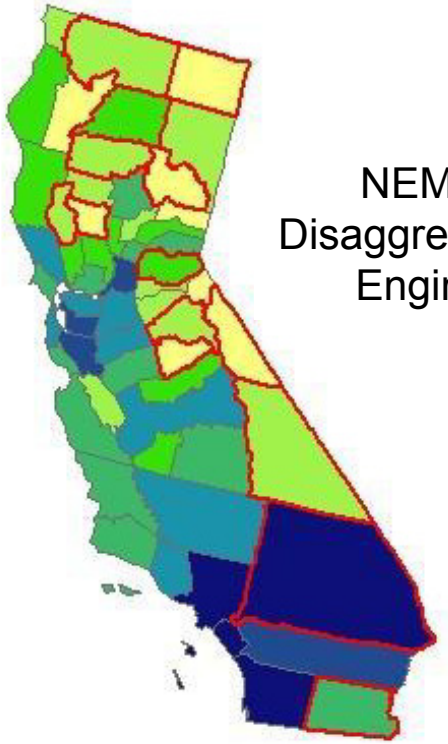


CEC County Sales Data

Year 2000 Residential Electricity Consumption







NEMS Disaggregation Engine

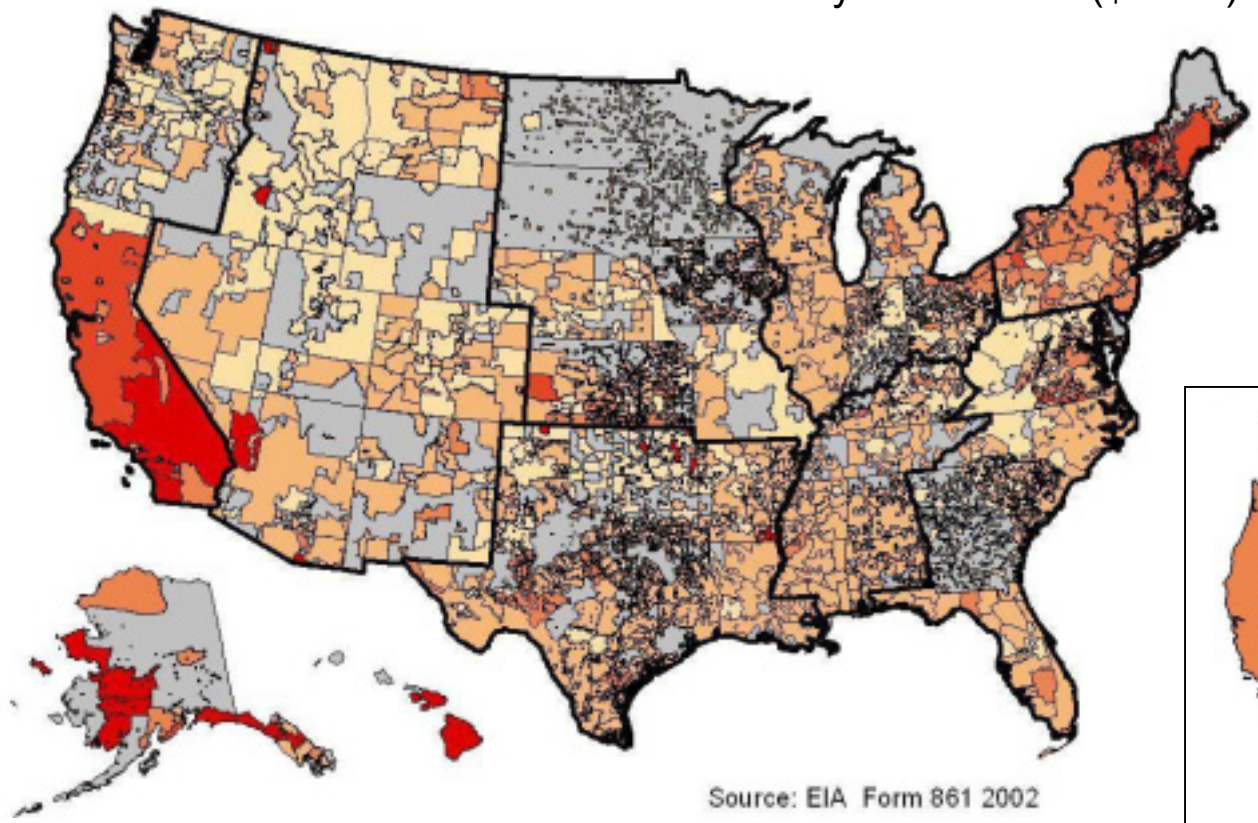
Created By: Jesse Cohen
University of Redlands, CA

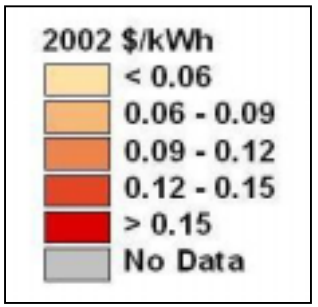
Potential Applications

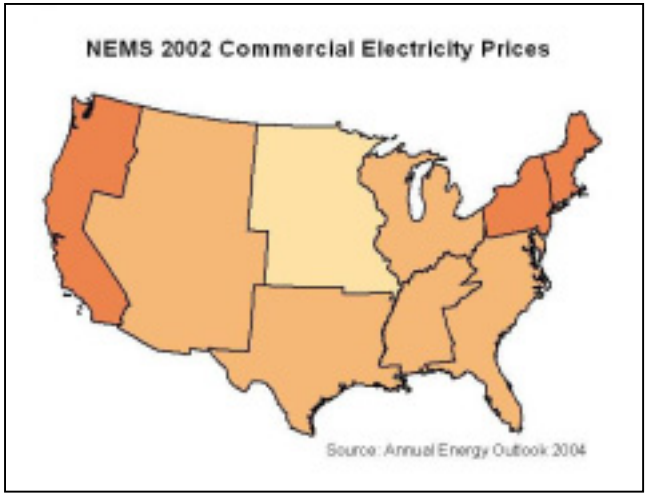
- Determine areas of high growth constraint due to limitations of the transmission system, AQ restrictions, etc.
- Analyze local benefits of technology adoption
- Allow for more accurate customer market analysis
- Identify regions of high future potential for alternative, distributed technologies

Regional Variation in Commercial Electricity Prices

2002 Commercial Rates by Utility Service Territory
Total Revenue Divided by Total Sales ($/kWh)







Conclusion

- The NEMS Disaggregation Engine is a demand side regionalization tool that is based on the forecasting capabilities of NEMS, and works directly to enhance the regional resolution in NEMS
- The scope is national but outputs are on a regional scale
- GIS is key to overlay of different weighting factors.
- Output can be generated for different fuels and sectors, but is dependent on the availability of regional forecast data.
- The tool is not tailored to a particular application, and can be applied to scenarios where regional demand is important

Residential Electricity Demand Density